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Information Bulletin

Grade 9 Mathematics 1995-96

This document was written primarily for:

Students	✓
Teachers	✓
Administrators	✓
Parents	
General Audience	
Others	✓ Superintendents

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This bulletin contains general information about the Provincial Student Assessment program and information specific to the Grade 9 Mathematics Achievement Test. **This bulletin replaces all previous bulletins.**

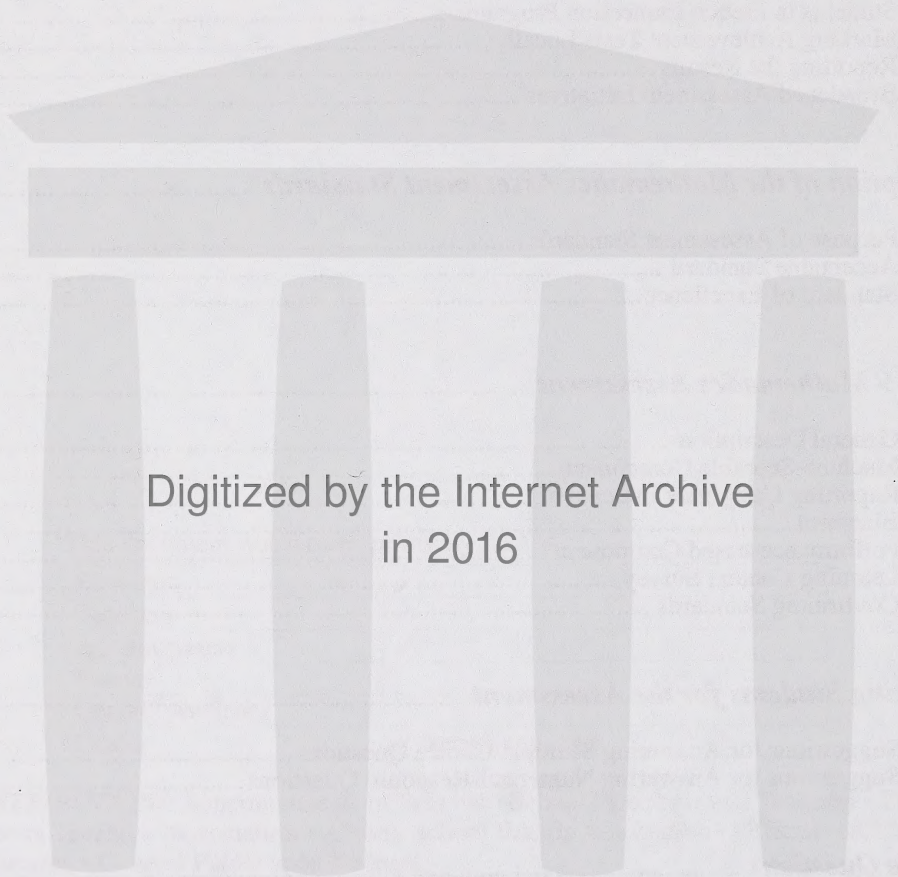
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October 1995

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General Information

The Provincial Student Assessment Program provides teachers, parents, students, school administrators, Alberta Education, and the public with information about what students know and can do in relation to provincial standards. Group results are reported at school, district, and provincial levels to improve learning opportunities for students.

The assessments are administered in two subject areas at Grade 3—language arts and mathematics—and in four subject areas at grades 6 and 9—language arts, mathematics, social studies, and science.

The assessments are based on provincial standards, which reflect important learnings in the subject areas listed above. Classroom teachers from across the province are extensively involved in developing and field testing the assessment instruments.

Administering the Assessment

Information about the nature of the provincial assessments as well as their administration to special needs students can be found in the *General Information Bulletin, Provincial Student Assessment Program*, which is mailed to all superintendents and principals in the fall each year.

Schedule

The written-response component of English and French Language Arts will be administered during the last week of May. The machine-scorable component of all achievement tests will be administered during the last two weeks of June. Specific information regarding scheduling is provided in the current *General Information Bulletin, Provincial Student Assessment Program*.

To minimize any risks to security, we recommend that all students complete the test on the same day. Superintendents approve a local schedule for achievement test administration within the dates provided. Students who are absent when the tests are administered and who return to school by the end of the school year must write the tests upon their return. By scheduling the tests early in the administration period, most, if not all, absentees can be tested upon their return to school. The principal is responsible for ensuring the security of the tests.

The tests that will be administered each year are:

Grade 3

English Language Arts (*Part A: Writing and Part B: Reading*)
Mathematics (English and French forms)

Grade 6

English Language Arts (*Part A: Writing and Part B: Reading*)
Français 6^e Année (*Partie A: Production écrite and Partie B: Lecture*)
Mathematics (English and French forms)
Science (English and French forms)
Social Studies (English and French forms)

Grade 9

English Language Arts (*Part A: Writing and Part B: Reading*)
Français 9^e Année (*Partie A: Production écrite and Partie B: Lecture*)
Mathematics (English and French forms)
Science (English and French forms)
Social Studies (English and French forms)

Students in French Immersion Programs

All students in French Immersion programs must write the French form of the achievement tests. Alberta Education will send a checklist to schools by January requesting an indication of how many English or French tests are required. These forms must be returned through jurisdiction offices by mid-February.

Marking Achievement Tests Locally

Teachers will be able to mark the tests before returning them to Alberta Education.

Teachers can use the results as part of an individual student's year-end assessment, as well as for planning instruction.

Reporting the Results

Each school jurisdiction will receive a district report and individual school reports for their students' achievement, as well as guidelines for interpreting these results in relation to provincial standards.

To facilitate reflection on school programs, we expect that results will be shared with all school staff (not just teachers of grades 3, 6, and 9), as well as with parents and the community.

An individual profile for each student will be sent to the school that the student will attend in September. We also expect that these reports will be shared with parents.

Provincial results for each subject and grade will be made public in September, in documents titled *Assessment Highlights*.

Broadened Assessment Initiatives

The Student Evaluation Branch has developed additional instruments to collect a broader base of information about what students know and can do than achievement tests themselves can provide. These instruments will be administered to a provincial sample of students in all subjects on a rotating basis. The following assessments will be given in 1996:

Grade 3

- problem-solving activities in mathematics

Grade 6

- “whole book” performance-based assessment in language arts

Grade 9

- problem-solving activities in mathematics

Description of the Mathematics Assessment Standards

The provincial standards are the basis upon which we assess how well students have learned mathematics by the end of Grade 9. These standards reflect essential learnings that all Alberta students are expected to achieve. Provincial standards are useful, therefore, for assessing Grade 9 students in all types of school programs—public, private, and home education.

Purpose of Assessment Standards

The following statements describe what is expected of Grade 9 students who are meeting the *acceptable standard* or the *standard of excellence* on independent work at the end of the Grade 9 Mathematics program. The statements represent the standards against which student achievement will be measured. By comparing actual results with expected provincial standards, decisions can be made about whether achievement is, in fact, “good enough.”

Acceptable Standard

Students who meet the acceptable standard in Grade 9 Mathematics are expected to have a basic understanding of concepts and procedural knowledge, and problem-solving applications. They are expected to demonstrate understanding in concrete, pictorial, and symbolic modes, and to be able

to translate from one mode to another. For example, students meeting the *acceptable standard* should know that the solution to the equation $4(x + \frac{1}{2}) = -3$ is $-\frac{5}{4}$ and be able to demonstrate their understanding by explaining how this solution can be arrived at and what it means for the solution to be $-\frac{5}{4}$. They are able to communicate and verify the solution in any of the three modes.

To meet the *acceptable standard*, students are expected to explore problems and describe results using graphical, numerical, physical, algebraic, and verbal mathematical models of representation.

Students meeting the *acceptable standard* are expected to perform the mathematical operations and procedures that are fundamental to mathematics in Grade 9 and apply what they know in solving straightforward problems in familiar settings. They are able to describe the steps they used to solve a particular problem and to verify and defend their solution to the problem.

The expectation is that students meeting the *acceptable standard* have a positive attitude about mathematics and a sense of personal competence in using mathematics. They are able to demonstrate confidence when using common mathematical procedures and when applying problem-solving strategies in familiar settings.

Standard of Excellence

Students who meet the standard of excellence in Grade 9 Mathematics are expected to have a superior understanding of mathematical concepts, related procedural knowledge, and novel problem-solving situations. They are comfortable demonstrating their

understandings in concrete, pictorial, or symbolic forms of representation. For example, they are able to show that a triangle maintains its shape and its size whenever it is reflected in either of the coordinate axes.

They are able to demonstrate this property by taking measurements off a relevant drawing, by using the properties of congruent triangles, and by using the length properties of segments on Cartesian grids. They are able to create and generalize problem situations to illustrate concepts and to analyze and explain relationships among concepts.

To meet the *standard of excellence*, the students are expected to model mathematical situations clearly, using oral, written, concrete, pictorial, graphical, and algebraic methods. They are expected to understand mathematical questions presented with objects, diagrams, or symbols in both common and unusual contexts.

Students meeting the *standard of excellence* are expected to perform the mathematical operations and procedures that are fundamental to mathematics in Grade 9 and to be able to apply mathematical thinking and modelling to solve and create non-routine problems. They are able to clearly describe the steps that they or other students used to solve a particular problem and can suggest alternative procedures and/or solutions. They are able to generalize solutions and strategies to new problem situations.

Students meeting the *standard of excellence* should have a positive attitude toward mathematics and show confidence in using mathematics meaningfully. They are expected to be self-motivated risk-takers who persevere when solving novel problems. They take initiative in trying new methods and are creative in their approach to problem solving.

Grade 9 Mathematics Assessment

General Description

The Grade 9 Mathematics Assessment consists of three components:

- *Machine-scorable component*—completed each year by all Grade 9 students in the province
- *Performance-based component*—completed in June 1996 by a provincial sample of Grade 9 students
- *Learning context survey*—completed in June 1996 by a provincial sample of Grade 9 students

Machine-Scorable Component

The machine-scorable component consists of two parts:

- The first part has 45 multiple-choice questions, each with a value of one mark
- The second part has 10 numerical-response questions, each with a value of one mark *

The assessment is designed to be completed in 75 minutes. However, additional time of up to 30 minutes may be provided to allow students to finish.

The blueprint for the assessment is on the next page of this bulletin and is followed by sample assignment questions that teachers can use with students to help them prepare for the provincial assessment.

Students will require HB pencils, rulers, protractors, and erasers.

Calculators are recommended.

Reporting Categories Indicators

The following points briefly highlight the learnings for each reporting category.

Knowledge

- recalls facts, concepts, terminology
- knows procedures for algorithms and computations, and for using formulas
- knows procedures for constructions, measurements, conversions, and order of operations
- knows mental computation and estimation strategies
- knows how to use calculators and computers

Skills

- applies basic mathematical concepts in familiar and unfamiliar situations
- demonstrates relationships among number systems, operations, number forms (fractions, decimals, powers, etc.), and concrete, pictorial, and symbolic representation
- demonstrates and applies relationships within equations and formulas
- demonstrates and applies relationships among geometric forms in a variety of situations
- demonstrates relationships between numbers and geometric forms
- uses a variety of strategies to solve problems
- applies data management skills to solve problems.
- judges the reasonableness of a solution

* All Grade 9 Achievement Tests will consist of 55 questions.

Reporting Categories	Knowledge	Skills	Total Number of Questions/Percent
Number Systems and Operations	6	8	14 (25%)
Ratio and Proportion	3	7	10 (18%)
Measurement and Geometry	4	8	12 (22%)
Data Management	3	5	8 (15%)
Algebra	5	6	11 (20%)
Total Number of Questions/Percent	21 (38%)	34 (62%)	55 (100%)

Performance-based Component

Performance-based assessment provides students with real-life problem-solving activities. This assessment addresses the learner expectations that cannot be easily measured using only paper-and-pencil strategies. In 1996, a provincial sample of Grade 9 students from across the province will be selected to participate in the activity-based assessment. The problem-solving and writing activities involved in the assessment have been developed by teachers and are designed to model good classroom instruction and assessment methods.

Learning Context Survey

In 1996, a learning context survey questionnaire will be given to a provincial sample of Grade 9 students. The purpose of the questionnaire is to examine the extent to which important math attitudes are evident, to look at student attitudes toward mathematics, and to correlate these attitudes with achievement.

Confirming Standards

Confirming standards is a process whereby judgements about students' performance on the assessment are made in relation to provincial standards. For more information on confirming standards procedures, refer to Appendix A of the *Achievement Testing Program Provincial Report, June 1993 Administration*. For information on the selection of teachers for participation in the confirming standards process, refer to the current *General Information Bulletin, Provincial Student Assessment Program*.

Preparing Students for the Assessment

I strongly advocate preparing children to understand tests and testing through extensive class discussion about the makeup of the test and how to take it, and then adequate practice to find out their own particular weaknesses in approaching tests.

—Graves, p. 183

We hope that teachers will share the following information with their students to help them prepare for the mathematics assessment.

Suggestions for Answering Multiple-Choice Questions

Use information given by:

- a. looking at all the information and thinking carefully about it before you try to answer the questions; or
- b. reading the questions first and then looking at the information, remembering the questions you need to answer.

When you need information for more than one question, remember to *go back to the information before answering **each** question.*

Make sure you look at all types of information given. Information may be given in words, charts, pictures, graphs, and maps.

Check your work when you calculate an answer, even when your answer is one of the choices.

When answering questions, *choose the answer you think is best.* If you don't see a correct or best answer right away, try to find the two choices that seem closest to the correct answer and choose one of them.

Suggestions for Answering Numerical-Response Questions

Make sure you look at all the information given.

Calculate your answer and check your work before entering the answer on the answer sheet.

Sample Questions

Suggestions for Teachers Administering the Sample Questions

The following suggestions are to help teachers administer the sample questions in the same way that the test will be administered.

Teachers are encouraged to familiarize their students with the kinds of questions that will appear on the achievement test by having them work through the sample questions. A practice answer sheet for the numerical-response questions is provided so that students can familiarize themselves with this new form.

These sample questions appeared in the June 1995 mathematics test. All other questions from the June 1995 test remain secured. Please note that this collection of questions does not represent the test emphasis as presented in the blueprint.

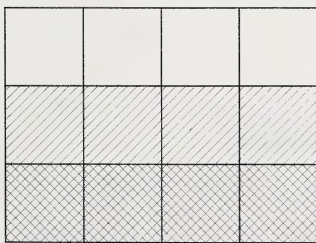
A table of the key and descriptors for the sample questions follows the questions on page 17.

Multiple-Choice Questions

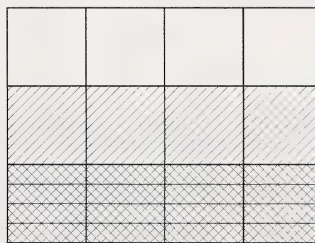
- The diameter of a virus is 0.000 009 95 mm. This diameter expressed in scientific notation is
 - 9.95×10^{-5} mm
 - 9.95×10^{-6} mm
 - 9.95×10^{-7} mm
 - 9.95×10^{-8} mm
- When a positive integer is **subtracted from** a negative integer, the result is
 - sometimes positive
 - always positive
 - sometimes zero
 - always negative
- Jane wants to plant $\frac{2}{3}$ of her garden plot with vegetables. She wants $\frac{1}{4}$ of the vegetables to be peas.

Which diagram represents $\frac{1}{4}$ of $\frac{2}{3}$?

A.



B.



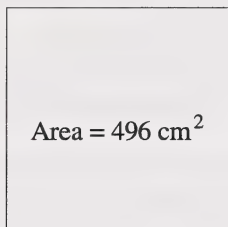
C.



D.



4. A student converted 1.05 to an improper fraction in the form of $\frac{a}{b}$. If one part of the fraction was 20, what was the other part?
- A. 1
 - B. 5
 - C. 21
 - D. 105
5. The area of a square is 496 cm^2 .



- Between which two consecutive integers does the length of each side of the square lie?
- A. 70 cm, 71 cm
 - B. 72 cm, 73 cm
 - C. 23 cm, 24 cm
 - D. 22 cm, 23 cm
6. What determines the name of a prism?
- A. The shape of the lateral face of the prism
 - B. The shape of the base of the prism
 - C. The number of corners in the prism
 - D. The number of faces that make up the prism

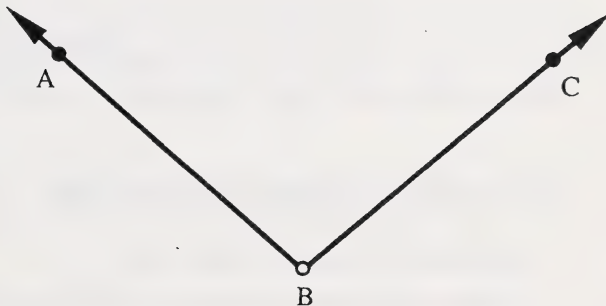
Use the information below to answer question 7.

The proportion of gold in jewellery and coins is measured in karats (K), with 24 K representing pure gold.

7. The value of pure gold is \$16.50/g. If a gold bracelet is marked 18 K and its mass is 60 g, what is the value of the gold in the bracelet?
- A. \$278.20
B. \$742.50
C. \$990.00
D. \$1237.50
-

8. The measure of $\angle ABC$ is

- A. 37°
B. 82°
C. 98°
D. 112°



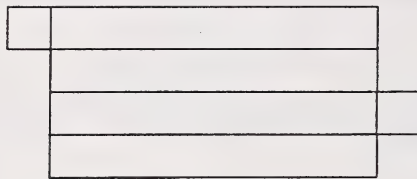
Use the information below to answer question 9.

At the 1982 New Year Festival in Ottawa, 17 000 people joined hands on the frozen Rideau Canal to form a human chain.

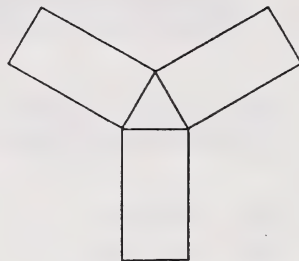
9. The **most** reasonable estimate of the length of this human chain is
- A. 2 km
B. 20 km
C. 200 km
D. 2000 km

10. Boxes from factories are shipped in the form of nets to save shipping space. Which net could be made into a rectangular prism?

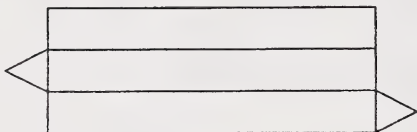
A.



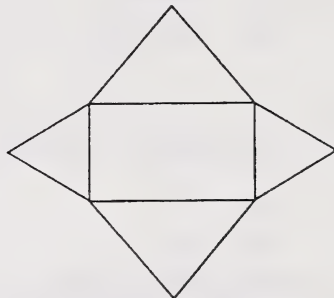
B.



C.



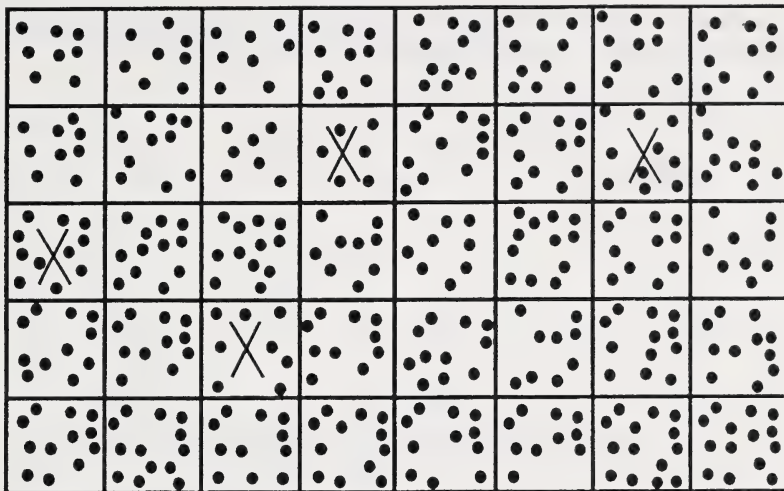
D.



11. Which sample is representative of its population?

- A. Population: citizens of a large city
Sample: 1 000 people chosen at random from those attending a hockey game
- B. Population: Grade 9 students in Alberta
Sample: 500 Alberta students chosen at random from the Grade 9 enrollment
- C. Population: citizens of Canada
Sample: 10 000 people chosen at random from the Halifax telephone book
- D. Population: Alberta voters
Sample: 10 000 people chosen at random from the Saskatchewan voters list

Use the information below to answer question 12.



A scientific experiment on the habits of penguins was carried out. This graph is a representation of an aerial photograph of penguins. A sampling procedure was used to estimate the total number of penguins in a specific region. The representative graph was divided into equal squares, and a random sample of four squares was chosen.

12. Using the four squares marked by X, the **best** estimate of the total number of penguins is

- A. 35
- B. 140
- C. 350
- D. 750

13. Twenty-nine students wrote a mathematics test. The median mark was 81. Paula was the only student to get 81. How many students scored higher than Paula?

- A. 23
- B. 15
- C. 14
- D. 13

Use the information below to answer question 14.

In a random sample of 200 joggers, a clothing store found that the joggers bought the size and colour of shorts as shown in the table.

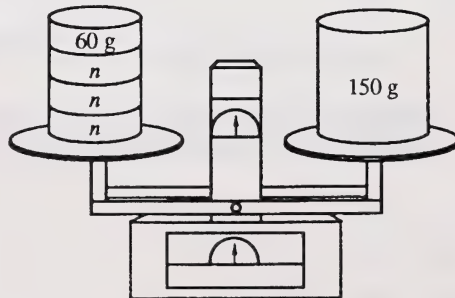
Size \ Colour	Red	Blue	Green
S	19	18	13
M	32	24	22
L	17	13	10
XL	13	10	9

14. If the store expects to sell 1 pair of shorts to each of 300 joggers, how many medium-sized blue shorts should the storekeeper order?

- A. 110
B. 84
C. 75
D. 36
-

15. Which equation represents the information on the balance scale at the right?

- A. $n^3 + 60 = 150$
B. $60n^3 = 150$
C. $3n + 60 = 150$
D. $3n - 60 = 150$



16. Kayla obtained a solution of -4 after correctly solving an equation. Which equation did she solve?
- A. $2(1 - x) = 16 - (2 - x)$
- B. $-4x + 8 = -8$
- C. $\frac{5x}{8} = \frac{5}{2}$
- D. $21 - 4x = 5$

Practice Answer Sheet for Numerical-Response Questions

Figure 1 shows a 10x10 grid of numbers. The columns are labeled 1 through 10 above them. Each column has a header row with a dot in the first two cells. Below each header row is a row of numbers 0 through 9. The numbers are arranged in a 10x10 grid, with each column labeled 1-10 above it. The numbers in each column are: Column 1: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9; Column 2: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9; Column 3: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9; Column 4: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9; Column 5: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9; Column 6: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9; Column 7: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9; Column 8: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9; Column 9: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9; Column 10: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9.

Numerical-Response Instructions

- Read each question carefully.
- When completing the test, you may use:

calculator (recommended)
eraser
ruler
scrap paper
protractor

- Record your answer on the answer sheet provided by writing it in the boxes and filling in a circle in **every** column. Be sure to fill in all **four** boxes and **four** circles.
- Mark only one answer for each question.
- Make sure that the number of the question on your answer sheet matches the number of the question you are answering.
- Use **only** an **HB** pencil to mark your answer.
- If you change an answer, **erase** your first mark **completely**.

Example 1

$$3^5 = 3 \times 3 \times 3 \times 3 \times 3$$

$$= 243$$

Answer: 0243

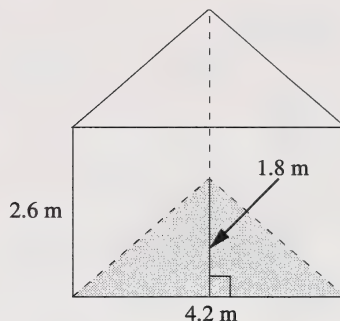
Record 0243 on the answer sheet

0	2	4	3
---	---	---	---

•	•		
0	0	0	0
1	1	1	1
2	•	2	2
3	3	3	•
4	4	•	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

Example 2

Find the volume of this solid.



$$\text{Area of the base} = \frac{1}{2}bh$$

$$= \frac{1}{2} \times 4.2 \times 1.8$$

$$= 3.78$$

$$\text{Volume of the solid} = Bh$$

$$= 3.78 \times 2.6$$

$$= 9.828$$

Since the measures are to the nearest tenth, the volume is 9.8 m^3 .

Answer: 9.8

Record 09.8 on the answer sheet

0	9	.	8
---	---	---	---

•	•		
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	•
9	•	9	9

These materials are used to produce 1.25 t of copper metal:

5 t raw ore
4500 L water
0.5 t acid

1. How many tonnes (t) of acid are needed to produce 200 t of copper metal?

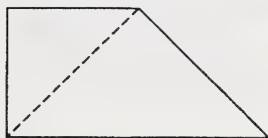
RECORD YOUR ANSWER IN THE NUMERICAL-RESPONSE
SECTION OF THE ANSWER SHEET

2. A cargo plane can hold 6 trucks and 7 jeeps or 8 trucks and 4 jeeps. If the plane is loaded with jeeps only, then what is the maximum number of jeeps it would likely hold?

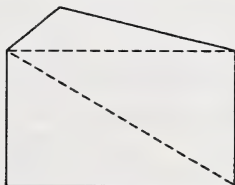
RECORD YOUR ANSWER IN THE NUMERICAL-RESPONSE
SECTION OF THE ANSWER SHEET

Use the information below to answer question 18.

For a four-sided polygon, the sum of the interior angles is $2 \times 180^\circ = 360^\circ$.



For a five-sided polygon, the sum of the interior angles is $3 \times 180^\circ = 540^\circ$.

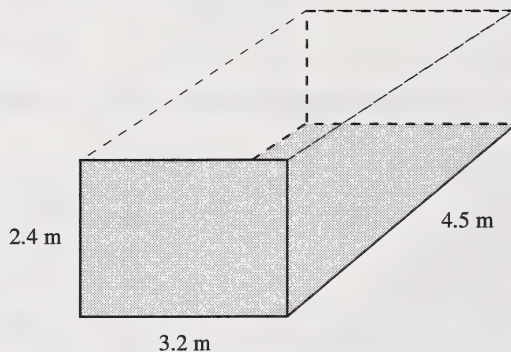


3. Continuing the pattern, what is the sum of the interior angles of a nine-sided polygon?

RECORD YOUR ANSWER IN THE NUMERICAL-RESPONSE
SECTION OF THE ANSWER SHEET

Use the following information to answer question 4.

Your bedroom has the dimensions shown below. Your room's height (floor to ceiling) is 2.4 m.



4. How long would it take an air filter to filter all the air in your room, if the filter processes 3m^3 of air per minute?

RECORD YOUR ANSWER IN THE NUMERICAL-RESPONSE
SECTION OF THE ANSWER SHEET

Key and Descriptors for Sample Questions

Part A: Multiple-Choice

Ques. No.	Key	Program Strand*	Reporting Category**	Curriculum Standard	Examples of Assessment Standard***
1	B	NO	K	Convert a decimal expression into scientific notation with a negative exponent	A
2	D	NO	S	Apply an understanding of the subtraction of integers	A
3	D	NO	S	Express the meaning of multiplication of proper fractions through a diagram	A
4	C	NO	S	Convert a decimal into a fraction and note which is the numerator and which is the denominator	A
5	D	NO	K	Approximate the square root of a number	A
6	B	MG	K	Recognize the characteristics of a prism	A
7	B	RP	S	Use a ratio to solve a problem	E
8	C	MG	S	Measure an angle with a protractor	A
9	B	MG	S	Estimate length through quantitative literacy and logic	A
10	A	MG	S	Relate a net to a rectangular prism	A
11	B	DM	K	Identify a representative sample of a given population	A
12	C	DM	S	Apply a sampling technique to estimate the total number	A
13	C	DM	K	Recall the meaning of median and calculate the number above it in a given population	A
14	D	DM	S	Interpret data from a random sample and make a prediction	A
15	C	A	S	Apply problem-solving skills to convert an equality balance into an equation	A
16	A	A	S	Check a solution for an equation involving integers	A

Part B: Numerical Response

Ques. No.	Key	Program Strand*	Reporting Category**	Curriculum Standard	Examples of Assessment Standard***
1	80	RP	S	Use a proportional ratio to solve a practical problem	E
2	16	RP	S	Determine a strategy using ratio and proportion to solve a novel problem	E
3	1260	MG	S	Develop a pattern to find the angle sum for a 9-sided figure	E
4	11.5	NO	S	Determine the operations needed to solve the problem and compute the answer	A

* A—Algebra; DM—Data Management; MG—Measurement and Geometry; NO—Number Systems and Operations; RP—Ratio and Proportion

** K—Knowledge; S—Skills

*** A—Students meeting the acceptable standard should be able to correctly answer questions such as these.

E—In addition to answering the questions identified for the acceptable standard, students meeting the standard of excellence should be able to correctly answer questions such as these.

Credit

Donald H. Graves, *Build a Literate Classroom* (Toronto: Irwin Publishing, 1991), p. 183.

Alberta Education Contact

Questions or comments regarding this bulletin should be directed to:

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